Technical Papers by IBM Authors Published Recently in Other Journals

"Autoindexing" and Indexing by Automatic Processes, P. B. Baxendale, *Special Libraries* **56,** No. 10, 715-719 (December, 1965).

An index is, intrinsically, a lexicon of accepted vocabulary that is intended to fulfill three functions: (1) it condenses the information contained in a document collection, (2) it provides a bridge by which the language of the author and that of the searcher can be reconciled, and (3) it is the instrument that governs the searching strategy. This distinguishes what an index is from the output that results when an index is used. Various forms of "autoindexing" are examined on this basis and are differentiated by the extent to which each of the three indexing functions is performed by automatic processes.

The BiSb Alloy Tunnel Junctions, L. Esaki and P. J. Stiles, *Physical Review Letters* **16,** No. 13, 574-576 (March 28, 1966).

Tunneling spectroscopy has been carried out in the BiSb alloy system to observe changes of the electronic band structure from pure Bi with an increase of Sb concentration.

A Business-Oriented Time-Sharing System, G. F. Duffy and W. D. Timberlake, *AFIPS Conference Proceedings, Spring Joint Computer Conference* **28,** pp. 265-275 (April, 1966).

Two years of systems experience in planning, installing and operating the IBM Administrative Terminal System (ATS) in a business environment has provided considerable knowledge of real-time applications. ATS is a multiprogrammed system that time-shares control of typewriter terminals and peripheral operations (tape-to-printer, etc.). The terminal operator can enter, retrieve, change, and store text or data. Text can be easily corrected, automatically formatted, and printed either on remote terminals or a high-speed printer.

This paper describes how the concept of ATS was introduced to management; how specific application areas were selected; planning for installation; and training of personnel.

Actual operating experience gained from the following applications is also described: text processing for proposals, specifications and engineering instructions; file maintenance for status reports, library book processing and manpower and schedule charts; direct data entry (keypunch simulation) for tape file update; and miscellaneous uses such as correspondence, form letters, and lists.

Calculation of the Dielectric Constant of a Fluid by Cluster Expansion Methods, D. W. Jepsen, *Journal of Chemical Physics* **44,** No. 2, 774-781 (January 15, 1966).

Corrections are obtained to the Clausius-Mossotti-Debye formula for the dielectric constant of a fluid of polar but nonpolarizable molecules by a cluster method. The calculation shows the contributions to the moment of the sample which depend upon the size (and presumably also the shape) of the sample explicitly. A new term, not found in other treatments, is obtained in the third order of the expansion of the Clausius-Mossotti function in powers of μ^2 which represents the effect of the exclusion of third molecules from between a pair which is close together.

Certain Properties of Gaussian Processes and their First-Passage Times, C. B. Mehr* and J. A. McFadden,** *Journal of the Royal Statistical Society,* Series B, **27,** No. 3, 505-522 (1965).

The class of Gauss-Markov processes is characterized by their covariances. A functional equation is solved, giving the class of all Gauss-Markov processes with stationary transition probabilities. The notion of a conditionally Markov-Gaussian process is introduced. A functional equation is solved which characterizes the class of stationary, conditionally Markov-Gaussian processes. A class of nonstationary conditionally Markov-Gaussian process is constructed. Using a transformation of the Wiener process, an explicit expression is obtained for the first-passage-time density function, from level $x_0 \neq 0$ at time t_0 to the level zero at time $t \geq t_0$ for all Gauss-Markov (G. M.) processes. For two particular classes of G. M. processes an explicit expression is obtained for the density of the first-passage time, from any level x_0 at t_0 to any level $x \neq x_0$ at time $t > t_0$. Some of the results are extended to a class of Gaussian processes which are not Markovian.

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The Chain—A New Magnetic Film Memory Device, H. O. Leilich, *Journal of Applied Physics* **37,** No. 3, 1361-1362 (March, 1966).

A copper strip plated with a nickel-iron film forms a new device for orthogonally switching word organized memories. The strip carries the word current. Bit-sense wires passing through holes in the strip determine the storage locations.

The device has closed flux in both word and bit directions, such that the film thickness, miniaturization, and bit packing density are not limited by demagnetization and

stray field phenomena. Films of 25,000 Å thickness give signals of 500 mV·nsec which allow the use of slower rising read pulses and less gain-bandwidth in the sense amplifiers relative to known thin-film devices. The configuration of the chain also enhances magnetic stability and permits nondestructive readout.

The characteristic impedance of the chain word line is strongly influenced by the film properties; stray fields and Ohmic losses are small. The bit-sense wire has a high impedance, very high bit density, and low attenuation; very large sense segments are possible.

The manufacture of chains can be done in a low-cost batch process, while the wiring of the array resembles the mass assembly process of ferrite core planes.

A Class of Nonlinear Recognition Procedures, C. K. Chow, *IEEE International Convention Record,* Part 6, pp. 40-50 (March, 1966).

In statistical recognition, the functional form of the underlying probability distributions determines the structure of recognition networks. Two approaches toward deriving a hierarchy of recognition procedures are reviewed and their implications concerning realization and estimation of recognition weights are discussed. The approaches are based on approximating the probability distributions by (1) orthogonal expansion and (2) a product of low-order conditional probabilities. Only binary measurements are considered here. Rademacher-Walsh functions are used as the orthogonal basis. A notion of tree dependence is introduced to effect the approximation by the product of low-order conditional probabilities. The chain dependence and the two-dimensional neighbor (or mesh) dependence are two instances of the tree dependence.

Computer Assisted Instruction, E. N. Adams, *Computers and Automation* **15,** No. 3, 12, 13 & 41 (March, 1966).

A general discussion is given of the way in which a computer may be made useful as a direct aid to instruction.

Configuration Interaction and the hfs of the sl Configuration, A. Lurio, *Physical Review* **142,** No. 1, 46-50 (February, 1966).

Accurate hfs measurements in both the singlet and the triplet states of the first excited configuration of the group II elements have recently been obtained. These results have shown that the hfs of the singlet state cannot be reliably predicted from a knowledge of the hfs of the triplet states. A modification of the Breit-Wills theory for the hfs of the *sl* configuration is developed which takes into account the fact that the *l* electron has a different radial wave function in the singlet and the triplet state. The theory introduces a new parameter λ (the ratio of the off-diagonal to the diagonal matrix element of the spin-orbit operator) which can be estimated from the fine structure. This modified Breit-Wills theory is compared to recent experimental data for first excited *sp* configuration of Cd, Ba, and Hg. For Hg and Ba excellent agreement between all the hfs of the *sp* configuration is obtained. For Cd a significant improvement is obtained but a discrepancy still remains which, however, can be explained.

Cutting Complexities With Occam's Razor, A. D. Pratt, *Special Libraries* **57,** No. 2, 91-95 (February, 1966).

A proposal is advanced, consisting of four elements: (1) a simpler classification scheme—the DDC, (2) simplification of the Cutter numbering system, (3) a system of subject headings appropriate to the particular library, rather than a large universal list, and (4) use of a small digital computer to prepare automatically catalogs, shelf lists, indexes, and similar listings in lieu of a 3 × 5 card catalog. The advantages are, in addition to those accruing to any simplification process, that the intellectual effort of the library professionals is focused more directly on the needs of the specific library, and the results of this intellectual effort are more readily available to the library's patrons.

Dielectric Relaxation in Thermally Grown SiO_2 Films, P. J. Burkhardt, *IEEE Transactions on Electron Devices* **ED-13,** No. 2, 268-275 (February, 1966).

An extensive investigation of the dielectric properties of thermally grown silicon dioxide films was performed in the temperature range 400° to 525°C. Principally, the variation of dissipation factor with frequency was observed at various applied peak fields and oxide thicknesses. In the temperature and frequency domain investigated, a large peak in the dissipation factor occurred, which corresponded to a massive capacitance dispersion with accompanying peaking of the loss factor at low frequencies. The phenomenon was apparently an ionic space charge polarization. Theoretical developments based on this model were verified by experiment. The activation energy for the relaxation time was 10.1 ± 0.4 kcal/mole. Examination of the oxide thickness dependence indicated that the carriers were not uniformly distributed initially but that a fixed number was present at a particular temperature and this number was independent of thickness. Further investigation led to the conclusion that a reaction between the metal electrode and the SiO_2 produced positively charged oxygen vacancies, which migrated through the oxide under the influence of an electric field. A mechanism for the production and migration of these vacancies is proposed that complies with the low activation energy as well as the observed temperature and electrode dependence.

Dielectric Thin Films Through RF Sputtering, P. D. Davidse and L. I. Maissel, *Journal of Applied Physics* **37,** No. 2, 574-579 (February, 1966).

Insulators cannot be sputtered with standard dc glow discharge techniques, because the accelerating potential cannot be directly applied and because the positive charge which accumulates on the surface during ion bombardment cannot be neutralized. Direct sputtering of insulators can be achieved by applying a high-frequency potential to a metal electrode behind the dielectric target. This technique was used to deposit thin insulating films. With a properly optimized electrode configuration and a superimposed magnetic field, deposition rates up to 2000 Å/min were obtained. Electrode potentials between 700 and 5500 V peak-to-peak were used. In all experiments described herein, the frequency was 13.56 Mc/sec and the pressure was 5×10^{-3} Torr. It was found that the introduction of oxygen into the argon sputtering atmosphere greatly reduced the deposition rate. Most experiments were carried out with borosilicate glass (Corning Pyrex 7740) and fused quartz. Without any special measures, films with a low pinhole density were obtained.

Digital Computer Solutions for Excitable Membrane Models, J. Cooley, F. Dodge and H. Cohen, *Journal of Cellular and Comparative Physiology* **66,** Supplement 2, No. 3, 99-109 (December, 1965).

This report presents a discussion of computational results from two mathematical models which have been applied to various problems on the excitable nerve membrane. To both of these models, the electro-diffusion theory and the empirical Hodgkin-Huxley model, K. S. Cole has made important theoretical, as well as experimental contributions. The report discusses numerical calculations from each of these models.

Effect of Type and Porosity of Gold Deposits on the Contact Resistance of Electroplated Materials, R. F. Walton, *Plating, Journal of the American Electroplaters' Society* **53,** No. 2, 153-216 (February, 1966).

Results of field environment tests of samples electroplated with six different types and combinations of gold on three types of substrates are discussed. The test specimens of copper, nickel, and silver substrates were electroplated with different thicknesses and combinations of gold, deposited from "acid," "neutral," or "cyanide" plating solutions. Each panel was tested to determine both the porosity of the gold deposit and the electrical contact resistance before and after corrosion of the specimen in field and laboratory environmental tests. Relationships are shown between the thickness of the type of gold deposited, the porosity of the deposit, and the electrical contact resistance due to corrosion products on the gold.

The Effects of Air Pollution on Electrical Contact Materials: A Field Study, R. V. Chiarenzelli and E. L. Joba, *Journal of the Air Pollution Control Association* **16,** No. 3, 123-127 (March, 1966).

A long-term field and laboratory program designed to determine and understand the effects of air pollutants on the performance of electric contact materials has reached the one-year mark. An extensive variety of metals has been exposed at six field environments, for periods up to one year (August 1963 to August 1964). These environments were selected to provide a wide range of air pollutants in typical data processing or process control situations. The program undertakes to determine material degradation as a function of time and environment. The important air pollutants at the field sites are measured regularly, and materials are returned periodically to the laboratory for evaluation using techniques developed specifically for this program. The results of the program to date are presented, and preliminary correlations are drawn.

Electron Beam Gun in an Exploratory Fabrication System, D. Zeheb, N. H. Kreitzer, and D. G. Cullum, *IEEE International Convention Record,* Part 9, p. 39 (March, 1966).

A semi-automatic, versatile system for fabrication of integrated arrays was constructed and tested. The work tool consists of a finely focused electron beam which is digitally controlled. Resolution is one part in 4096. Input information is provided via magnetic tape. Mechanical positioning of the work piece is by stepping motors with resolution of 0.0002 inch. Accurate registration, utilizing secondary emmission, is provided for multiaccess applications.

The Electronic States Around a Dislocation, M. C. Gutzwiller and R. O. Wells, Jr.,* *Journal of the Physics and Chemistry of Solids* **27,** No. 2, 349-352 (February, 1966).

The propagation of an electron through a crystal is conceived as involving two qualitatively different mechanisms, a quasifree motion as in empty space and a jumping from one localized state attached to an atom to another. A Hamiltonian containing two terms corresponding to these mechanisms is examined, and its behavior in the presence of a dislocation is studied. In particular, the case of a screw dislocation is investigated, and all the eigenfunctions are found under the assumption that there is no screening. The electron density in the neighborhood of the screw dislocation is computed. It is shown that there is a net repulsion of the electrons from the dislocation axis which results in a well defined positive effective charge per unit length, even though there is no volume change.

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Electronic Structure of C_2,† P. F. Fougere* and R. K. Nesbet, *Journal of Chemical Physics* **44,** No. 1, 285-298 (January 1, 1966).

The electronic structure of the C_2 molecule has been studied over the range $R = 1.5a_0$ to $8.0a_0$ using three different Slater-type-orbital basis sets and two different levels of configuration interaction. Analytic potential curves and computed spectroscopic constants are given for all states studied. The behavior of all eigenvalues of each CI matrix was studied extensively with excellent agreement between molecular results and those obtained by independent calculations on a pair of separated carbon atoms. The Wigner-Witmer rules were obeyed in every case.

Observed and computed spectroscopic constants were highly correlated statistically; linear relationships were determined which allow semiempirical prediction of spectroscopic constants for those states not yet observed. Using the predictions for T_e, an electronic spectrum has been derived.

† This work is based in part on a dissertation submitted by P. F. Fougere to Boston University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Physics, May 1965.

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Energy-Absorption Method for Determining Quality of Molded Plastic Parts, J. P. Walsh, *Proceedings of the 22nd Annual Technical Conference, Society of Plastics Engineers* **12,** pp. 24–3-1 to 24–3-7 (March 10, 1966).

A simple, accurate, and reliable method of detecting the quality of molded plastic parts is now possible by measuring the energy absorption of the molded materials. For large parts a section of the part is checked by tensile-strength measurements, and for small parts the complete part is checked by compression testing. Stress-strain diagrams, whether for tension testing or compression testing, can be numerically designated, making comparative evaluation of materials more meaningful.

Ervaringen met de Computer in een Bibliotheek (Experiences with a Computer in a Library), J. F. C. Boomsma, *Tijdschrift voor Efficiency en Documentatie* **36,** No. 1, 42-46 (January, 1966).

This paper describes a system called Computerized Document Information Transactions (CODIT), which makes use of an IBM 1410 for handling administrative data and for information processing. The output consists of records-checking data and KWIC hand-sorted index cards, catalogues, SDI and Information Retrieval. The file can be adapted for use as a text searching system.

Flexible Recording Surfaces of Electrodeposited Cobalt-Nickel-Phosphorus, J. S. Judge, J. R. Morrison and D. E. Speliotis, *Plating, Journal of the American Electroplaters' Society* **53,** No. 4, 441-450 (April, 1966).

A process is described for fabricating magnetic recording surfaces by the metalizing of Mylar with electroless nickel and subsequent electrodeposition of a cobalt-nickel-phosphorus magnetic layer on the nonferromagnetic electroless nickel. A mercury contact system was used to make positive contact to the highly resistive and highly flexible substrate. The unusual condition of continuously varying current density during electrodeposition is characterized and experimentally verified. It is shown that primary control over the magnetic properties (and therefore the recording properties) of the electrodeposited layer can be achieved by variation in the composition of the plating solution. The thickness of the magnetic layer has a significant effect on the coercivity in the region of thickness 0.125–0.5 micron (5–20 microinches). The recording performance of these surfaces is superior for high-density applications. Some samples have been shown to be capable of sustaining densities up to 40,000 flux changes per inch (15,800/cm). The corrosion behavior of these surfaces on exposure to high humidity has been shown to have a logarithmic dependence on time.

Functions Which Operate on Characteristic Functions, A. G. Konheim and B. Weiss, *Pacific Journal of Mathematics* **15,** No. 4, 1279-1293 (1965).

Let G be a locally compact abelian group and $B^+(G)$ the family of continuous, complex-valued non-negative definite functions on G. Set

$$B_1^+(G) = \{f \in B^+(G) : f(0) < 1\}$$

$$\Phi(G) = \{f \in B^+(G) : f(0) = 1\}.$$

A complex-valued function defined on the open unit disk is said to *operate* on $\{B_1^+(G), B^+(G)\}$ if $f \in B_1^+(G)$ implies $F(f) \in B^+(G)$, similarly for $\{\Phi(G), \Phi(G)\}$. Recently C. S. Herz has given a proof of a conjecture of W. Rudin that F operates on $\{B_1^+(G), B^+(G)\}$ if and only if

$$F(z) = \sum_{m,n=0}^{\infty} c_{mn} z^{m-n} z, \qquad c_{mn} \geq 0, \qquad |z| < 1,$$

for a certain class of G. We shall show by independent methods that F operates on $\Phi(R^1)$ if F is given by the above equation for $|z| \leq 1$ and $F(1) = 1$. This answers a question posed by E. Lukacs and provides in addition an alternate proof of Herz's theorem.

Growth of Optical Plane Waves in Stimulated Brillouin Scattering, R. G. Brewer, *Physical Review* **140,** No. 3A, A800-A805 (November 1, 1965).

Several classical plane-wave theories have been proposed recently to explain the observations of stimulated Brillouin scattering in solids and liquids. While previous experiments have been successful in demonstrating the effect, the use of focused excitation has prevented a critical test of theory. In the present work, the collimated beam of a giant pulse laser source excites a liquid, *n*-hexane, external to a cavity, and allows the Brillouin scattering intensity to be measured as a function of optical path length. The type of transient solution considered by Kroll comes closest to describing the observed gain curve, which includes a large spatial amplification and no apparent threshold condition. The results lead to values for the Pockel's photoelastic constant and the hypersonic acoustic lifetime. With collimated excitation, a striking "acoustic burst" whose intensity parallels the path-length dependence of the Brillouin scattering is noticed. This suggests that the acoustic wave generated in the Brillouin process initiates a shock wave which could lead to material fracture or cavitation. With focused excitation, an additional mechanism involving plasma formation appears to operate.

Heats of Solution of Some Trifluoroacetates, Tetraphenylborates, Iodides, and Perchlorates in Water and in Propylene Carbonate and the Relative Enthalpies of Solvation of the Alkali Metal Ions in Propylene Carbonate, Y.-C. Wu and H. L. Friedman,* *The Journal of Physical Chemistry* **70,** No. 2, 501-509 (February, 1966).

The enthalpies of transfer of the alkali metal ions from water to propylene carbonate (dielectric constant 65.1) at 25° have been determined calorimetrically with the following results for the ΔH relative to that for Na^+: Li^+, 3.17; Na^+, 0; K^+, −2.80; Rb^+, −3.43; Cs^+, −3.96 kcal/mole. Each of these values has been derived from two independent sets of data with the disparity between independently determined values being, at most, 0.26 kcal/mole. The solvation enthalpies and their correlation, by means of the theory of Latimer, Pitzer, and Slansky, are derived and discussed. Lithium trifluoroacetate is a very weak electrolyte in propylene carbonate, $\Lambda/\Lambda°$ being only 0.6 in 0.001 M solution. The association produces not only ion pairs but also a large proportion of a larger aggregate.

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Hfs of F^{19} in the Electron Paramagnetic Resonance of $MgF_2:Co^{++}$, H. M. Gladney, *Physical Review* **143,** No. 1, 198-209 (March 4, 1966).

The complex hyperfine structure of the X-band EPR spectra of Co^{++} as a dilute substitutional impurity in a single crystal of MgF_2 has been assigned. Where the x and z axes are taken along the bond direction of the two equivalent fluorine ions and along the crystalline c axis, respectively, the values of the spin-Hamiltonian tensors are: for the gyromagnetic ratio, (6.0327, 2.2970, 4.2391) Mc/sec; for the cobalt hyperfine interaction, (637.1, 123.3, 210.0) Mc/sec; for the hfs of the two equivalent F^{19} nuclei along the [110] direction, (308, 59, 76) Mc/sec; for the four equivalent F^{19} nuclei in the [110] plane, (92, 76, 162, 49)

Mc/sec. In the last case the final component is the off-diagonal yz contribution. First-order perturbation theory for the F^{19} superhyperfine structure predicts splittings independent of the cobalt nuclear-spin number. However, even though the F^{19} interactions are two orders of magnitude smaller than the Zeeman effects, for some magnetic-field orientations the observed splittings vary as much as 50% across the spectrum. The effect may be traced to fourth-order perturbations (squared in both the Co hyperfine and F^{19} hypefine interaction) between nearly degenerate states. A set of computer programs to relate EPR spectra to spin-Hamiltonian parameters was essential to the analysis reported.

High Purity Gas and Water Systems, M. A. Kurlander, *Contamination Control Journal* **5,** No. 2, 14-19, 31 (February, 1966).

This article covers the criteria for a high purity gas and water system and is not intended to cover general plumbing piping. Systems which shall be treated as high purity gas systems are nitrogen, hydrogen, oxygen, argon and forming gas. Extreme caution must be exercised during all operations associated with these systems to assure that they are delivered as high purity systems. Fabrication, installation and audit are performed by personnel who have been qualified in accordance with the requirements needed to maintain purity. The assurance of controlled contamination from supply to point of use is discussed.

Homeomorphic Conjugacy of Automorphisms on the Torus, R. L. Adler and R. Palais,* *Proceedings of the American Mathematical Society* **16,** No. 6, 1222-1225 (December, 1965).

The equation $\gamma \alpha \gamma^{-1} = \beta$ is solved for a mapping γ, where the mappings α and β are ergodic automorphisms on the torus and γ is a homeomorphism on the torus. The result is that γ is an automorphism on the torus composed with a translation by a fixed point of β.

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Image Information, Classification and Coding, P. D. Dodd and F. B. Wood, *IEEE International Convention Record,* Part 7, pp. 60-71 (March, 1966).

Since information content and redundancy vary in documents of different types, these variations must be measured to classify the images for efficient compression and transmission in an automatic document-handling system. Measuring the ϵ-entropy (where ϵ is the scanning resolution), we compared information content and redundancy in numerous examples of three major types of documents. We then plotted the relationships between classes identified and compression ratios reported (theoretical, simulated and actual) to indicate the state of the art. Improved compression ratios may depend on adaptive scanning, which can identify each document by class and switch to an appropriate compression code.

Improved Turn-Off Characteristic for Multivibrators, R. A. Jensen, *Electro-Technology* **77,** No. 3, 91-92 (March, 1966).

Although several techniques are widely used to improve the slow turn-off characteristic of multivibrator circuits, none completely solve the problem and most introduce undesirable effects. The technique described here, adding one transistor to the circuit, results in the same rapid switching and low impedance during turn-off as are possible during turn-on. The application of the technique to astable and flip-flop multivibrators is illustrated, and the resulting waveforms are shown.

Index Register Allocation, L. P. Horwitz,* R. M. Karp, R. E. Miller and S. Winograd, *Journal of the Association for Computing Machinery* **13,** No. 1, 43-61 (January, 1966).

A procedure for index register allocation is described. The rules of this procedure are shown to yield an optimal allocation for "straight line" programs.

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Influence of Mode Number and Mode Degeneracy on the Output of a Ruby Laser, H. Wieder, *Journal of Applied Physics* **37,** No. 2, 615-621 (February, 1966).

The conjugate-concentric ruby resonator is a system in which a ruby lens images each of the external mirrors on the other. By merely perturbing the geometry of the resonator, it is possible to obtain three distinct types of output: quasicontinuous, regular spiking, and random spiking. From the results of various experiments which have been performed on the system, it was concluded that two parameters are sufficient to determine which of these outputs will be obtained from a multimode resonator. Regular spiking is favored over random spiking if the mode number exceeds some critical value; quasicontinuous behavior is favored over regular spiking if, in addition, the modes exhibit degeneracy. The experimental results are compared with some existing theories.

Instrumentation Maintainability Assurance by Design Review, R. E. Redfern, *The Maintainer* **2,** No. 1, 3-6 (February, 1966).

The use of design review is discussed in terms of its contribution to assuring the development of a maintainable product. The philosophy of design review and the functional relationship of the instrument maintenance engineer is discussed in some detail. Emphasis is given to the time phasing of design reviews and the matters of concern to the instrument maintenance engineer at various stages throughout the development program.

Ionic Adsorption and Dissociation Cross Section for Nitrogen, H. F. Winters, *The Journal of Chemical Physics* **44,** No. 4, 1472-1476 (February 15, 1966).

The adsorption of energetic N_2^+ ions on nickel and molybdenum surfaces has been investigated. Comparison of the sticking probabilities of N_2^+ and Ar^+ as a function of ion energy indicates that the binding mechanism for these two gases is different. The experimental evidence suggests that the mechanism causing adsorption of N_2^+ may be dissociation upon collision with the surface and the subsequent adsorption of the resulting atomic nitrogen.

The total absolute dissociation cross section has also been measured in nitrogen for electron energies from 0 to 300 eV. The cross section has a maximum value of 2.10^{-16} cm^2 at an electron energy of about 90 eV.

An Isomorphic Notation of Switching Circuits, F. L. Wang, *IEEE Transactions on Electronic Computers* **EC-14,** No. 6, 952-954 (December, 1965).

A simplified notation which gives a one-to-one correspondence between the equation and the implementation is introduced to switching circuits. The application of nested parentheses makes the notation suitable for programming. It maintains essentially the ordinary algebraic equation form and may facilitate the development of more minimization theorems.

Kinetics of the Reaction HI-⟨111⟩ Ge, A. Reisman and M. Berkenblit, *Journal of the Electrochemical Society* **113,** No. 2, Part I, 146-152 (February, 1966).

Experiments are described which appear to differentiate between mass transport and surface reaction kinetics in the open tube reaction of gaseous hydrogen iodide with ⟨111⟩ germanium surfaces. Surface limiting reaction behavior is not observed until average linear gas stream velocities in the neighborhood of 800,000 cm/min are attained. The limiting reaction rate for the etching reaction is described by the equation $\log R_f = -3.64 \times 10^3/T°K + \log \rho_{HI} + 5.42$, R_f having the dimensions mg/cm^2 hr. The reaction order was found to be unity which together with other information suggested that the desorption of germanium iodides constitutes the rate-limiting step. Autodoping phenomena are examined in view of the speed of the etching reaction, and calculated rate data for probable deposition reactions are presented.

Kinetics of the Thermal Oxidation of Silicon in Dry Oxygen, P. J. Burkhardt and L. V. Gregor, *Transactions of the Metallurgical Society of AIME* **236,** 299-305 (March, 1966).

The oxidation kinetics of single-crystal silicon has been investigated using extremely dry oxygen as the oxidant. Two techniques were used. The first involved a flow system with which incremental thickness measurements were made. This system provided an oxygen ambient atmospheric pressure which had a moisture content of less than 0. ppm of water. The second technique involved measuring the change in volume of oxygen with time in a closed system. A temperature range of 900 to 1200°C and a pressure range of 20 to 760 Torr were covered. Both techniques showed that a simple parabolic rate law holds only at the higher temperatures. At lower temperatures, the data up to 5000 Å can be fitted well to a linear-parabolic equation. The two constants in this rate equation are examined in terms of a physical model. The parabolic portion of the low-temperature oxidation fits along the high-temperature curve of an Arrhenius plot. The parabolic rate constant for the flow-system technique can be expressed by $k = 2 \times 10^{-9}$ exp $(-31$ kcal$/RT)$ sq cm per sec. The manostatic technique gave $k = 1 \times 10^{-10}$ exp $(-23$ kcal$/RT)$ sq cm per sec. By extending the thickness range to over 10^4 Å, a rate law of $X = At^n$ seems to fit all of the data better than the linear-parabolic law. Here the exponent n increases from 0.518 at 1150°C to 0.637 at 900°C.

Lattice Vibrational Waves in Cubic Crystal Plates, D. C. Gazis and R. F. Wallis,* *Acta Mechanica* **I,** No. 3, 253-264 (1965).

An investigation is given of the lowest symmetric (extensional) and the lowest antisymmetric (flexural) mode of waves in a cubic crystal plate bounded by two planes of symmetry. The investigation was carried out using the continuum theory of anisotropic elasticity, and also using a simple cubic lattice model. Particular attention was given to the change of the character of both the extensional and flexural mode, which takes place as the wave length is decreased from infinity down to values of the order of the plate thickness. Both modes tend to become surface modes whenever surface waves are possible along the direction of propagation. However, some essential differences were observed, regarding this transition from bulk modes to surface modes, between materials which propagate Rayleigh surface waves and those which propagate generalized Rayleigh surface waves.

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Low-Temperature Internal Friction Peaks in Si and Ge Crystals, B. M. Mecs and A. S. Nowick, *Applied Physics Letters* **8,** No. 4, 75-76 (1966).

A new internal friction peak has been found in Si or Ge crystals whose surfaces were damaged by cutting and polishing. The peak occurs near 170°K for frequencies of about 2000 cps, but the exact peak temperature depends on crystal orientation. It is attributed to a state of deformation in the surface layer.

Magnetic and Quadrupolar Echoes in Aluminum Metal, M. K. Dowley, *Solid State Communications* **3,** No. 11, 351-354 (November, 1965).

Pulsed nuclear resonance with small Al particles reveals two echo maxima for the pulse sequence $90° - \tau - \phi$ at ϕ's of 40° and 180°. The echoes can be understood by considering static electric field gradients as well as magnetic perturbations. The perturbation distribution functions can be extracted.

Mechanism Behind Emitter Dip Effect, R. Gereth* and G. H. Schwuttke,** *Applied Physics Letters* **8,** No. 3, 55-57 (February 1, 1966).

Localized indentations in the base-collector junction underneath the entire emitter regions are frequently observed in high frequency *npn* silicon transistors. This phenomenon is referred to as Emitter Dip Effect (EDE). X-ray diffraction microscopy, using the scanning oscillator technique, is employed to explore the nature of the EDE. Large area x-ray topographs, taken after the various processing steps, exhibit large SiP precipitates or some unidentified impurity complexes in the emitter regions. It is most likely that the new phases separate from the crystal matrix when cooling the silicon slice. Excess neutral vacancies are generated at the sites of the observed precipitates. These vacancies will partly diffuse toward the base-collector junction where they enhance the diffusion constant of the base impurities and thus cause the EDE.

* The diffusion experiments were carried out when R. G. was with the Shockley Research Laboratories, Palo Alto, California.

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A Model of Pulse Generation in the Peripheral Nervous System, W. L. Miranker, *Kybernetik* **3,** No. 1, 13-17 (January, 1966).

A model of pulse generation in the peripheral nervous system is discussed in this paper. The model uses no nonlinear circuit analogues of cellular membrane but rather a direct piecewise linear characterization of the membrane permeability changes and related ionic transport which accompany pulse generation. The relative simplicity of the model notwithstanding, predictions of pulse frequency versus generator potential amplitude relationship and pulse frequency versus pulse amplitude relationship as well as the threshold property of the process are correctly furnished by straightforward calculations.

Moiré Patterns with Display-Type Low-Energy Electron Diffraction Apparatus, R. E. McCurry, *Journal of Applied Physics* **37,** No. 2, 473-479 (February, 1966).

This paper describes an investigation of the origin of Moiré patterns which occur in display-type low-energy electron diffraction apparatus. With both planar and spherical geometry, "real" multiple source Moiré patterns have been observed. With planar geometry, quantitative comparison of experiment and theory for the average Moiré fringe spacing and pattern location are shown to be in good agreement. Spherical geometry patterns can be understood qualitatively on the same basis.

Molecular Orbital Theory and the Physical Properties of Molecules, R. K. Nesbet, *Journal of Chemical Physics* **43,** No. 10, S30 (November 15, 1965).

In recent years, it has become possible to compute Hartree-Fock molecular orbitals for molecules more complex than H_2. Qualitative implications of this quantitative work are discussed, with emphasis on the identification of electronic excited states, on molecular electric dipole moments, and on the net correlation energy contribution to molecular dissociation energies.

Multiple Source Moiré Patterns, R. E. McCurry, *Journal of Applied Physics* **37,** No. 2, 467-472 (February, 1966).

Moiré patterns produced by viewing a large number of spatially periodic light sources through an appropriate grid structure of similar periodicity are sometimes characterized by a spatial location away from the grid structures. This paper gives a simple geometrical obstruction theory of this effect. It also demonstrates that the results predicted are observable.

Multiple Source Moiré Patterns with Photographic Diffraction Gratings, R. E. McCurry, *Journal of Applied Physics* **37,** No. 2, 479-482 (February, 1966).

Moiré patterns of the multiple source type can be used in the evaluation of line shape, line spacing, and grating plane separation of two nearly identical gratings. For line spacing analysis, the location of the MP indicates which of the gratings has the greater line spacing in a particular region. A difference in the average spacing of the order of one part in 10^7 between adjacent lines has been detected.

Natural Frequencies of Transversely Vibrating Uniform Annular Plates, S. M. Vogel and D. W. Skinner, *ASME Transactions, Journal of Applied Mechanics* **32,** No. 4, 926-931 (December, 1965).

Frequency determinants are derived for various combinations of boundary conditions associated with the transverse vibrations of uniform annular plates. From these equations, the values of the resonant frequencies of the various normal modes are calculated. Graphs and selected tables are included to facilitiate the use of this material for design purposes. The results of an experimental investigation of two of the cases are also presented, and the agreement between these findings and the theoretically predicted values is remarkably good.

New Horizons in Semimetal Alloys, L. Esaki, *IEEE Spectrum* **3,** No. 2, 74-86 (February, 1966).

Recent works on bismuth and its alloys have shown that these materials exhibit unique and intriguing properties, particularly in the cryogenic temperature.

Noise Simulators Help Find Peril in Power-Line Defects, M. L. Tandon, *Electronics* **39,** No. 5, 117-121 (March 7, 1966).

Studies show that commercial power distribution systems are subject to voltage dips and short-duration, short rise-time transients. Power-line voltage dips and high-frequency transients are inevitable on such power distribution systems. As a result of the constant effort to increase circuit speeds and to reduce operating signal levels, electronic circuits are becoming very sensitive to voltage anomalies. To ensure reliable operation of electronic equipment in noisy environments, equipment operation must be checked in such environments during the development phase and during quality control.

This article discusses the design considerations of devices used to simulate power-line voltage dips and high-frequency transient noise. It also shows how the testing of electronic data processing equipment, using these noise

simulators, results in (1) the evaluation of equipment susceptibility to conducted power-line noise, and (2) the improvement of relative immunity to such noise, to meet a required figure of merit.

Nondestructive Readout Coupled Film Memory Device, C. H. Sie, *Journal of Applied Physics* **37,** No. 3, 1375-1378 (March, 1966).

By magnetostatically coupling a soft film and a hard film with their easy axes orthogonal to each other, an NDRO memory device with fast read cycle speed has been achieved. This device differs from the previously investigated NDRO devices as follows: (1) The partially magnetized state of the hard film is utilized for information storage. (2) Since the device is read and sensed along the transverse axis of the soft film, low read current can be used. The calculated results of possible combination of the soft and hard film characteristics that will result in a device with this mode of operation are presented. A 10-kÅ NiFe (80-20) film and a 10-kÅ CoFe film (50-50), each evaporated on a polymer substrate, are used respectively as the soft and hard films of the device. The insensitivity of this device to bit disturb pulses is established by measuring the pulse hysteresis of the CoFe film's partially magnetized state. It is interesting to note that as long as the CoFe film is switched into these partially magnetized states by other than a time-limited process, the states are stable. Finally, the feasibility of this device for memory operation is evaluated experimentally in terms of driver current tolerances and signal-to-noise ratio.

Ordering in Linear Antiferromagnetic Chains with Anisotropic Coupling, A. S. Edelstein,* *Physical Review* **142,** No. 1, 259-263 (February, 1966).

Some reasonable conjectures are made concerning the finite-temperature pair correlations of spins with anisotropic antiferromagnetic coupling. These conjectures provide a general description of the ordering. Using them together with the finite value of the zero-temperature susceptibility, one obtains

$$S_1 < S_3 < \cdots < 0 < \cdots < S_4 < S_2,$$

where

$$S_n = 1 - (-1)^n\omega_\infty + 2\sum_{l=1}^{n}\omega_l,$$

ω_l is the zero temperature pair correlation, and ω_∞ is the infinite-l limit of $|\omega_1|$. Bonner and Fisher's finite-chain extrapolations for ω_l are in agreement with this result. Using their values of $\omega_l(l = 1, 2, 3, 4, \infty)$ and the inequality, bounds are computed for ω_5. The further conjecture that the rate of decrease in the absolute value of the correlation with distance is monotonic leads to a contradiction near the Heisenberg limit. The role of ω_∞ in the inequality and its derivation is particularly interesting since the limit $l \to \infty$ followed by $T \to 0$ of the pair correlation of spins separated by $l - 1$ spins is probably zero and not ω_∞. When the correlations approximate their zero-temperature value out to a distance ξ such that $|\omega_\xi| \approx \omega_\infty$ and decrease slowly thereafter with increasing separation, then $T\chi$ is approximately zero.

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Origin of High Coercivity in Chemically Deposited Cobalt-Phosphorus Films, D. E. Speliotis, J. S. Judge and J. R. Morrison, *Journal of Applied Physics* **37,** No. 3, 1158-1159 (March, 1966).

Films of Co–P, varying in composition from 2.5% to 5% P and varying in thickness from 200 to 2500 Å, were prepared by chemical deposition. The coercivity of these films was found to be a function of both P content and thickness. The particle size of these films increased with increasing thickness and was a function of the P content. The films were annealed in a reducing atmosphere at various temperatures up to 500°C. The low-coercivity films undergo a transformation to films exhibiting coercivities of ~250 Oe at a temperature of 250°C. The intermediate-coercivity films remain essentially unchanged, whereas the high-coercivity films drop sharply in coercivity at ~400°C to this apparent "equilibrium coercivity" of ~250 Oe. Etching experiments on these samples show no drastic effects on coercivity. The coercivity merely proceeds back along the original coercivity-versus-thickness curves. Structural and magnetic evidence indicates the existence of an equilibrium magnetic structure in these films which is primarily dependent on particle size.

Pilot Plant Puts DDC to the Test, P. E. A. Cowley, *Control Engineering* **13,** No. 2, 53-56 (February, 1966).

A pilot plant, based on the distillation process, was built at San Jose for the development and evaluation of direct digital control. Both hardware and software are under development. The main features of the plant are the process itself, the instrumentation and the control computer.

Porosity Testing of Electroplated Gold in Gelled Media, F. V. Bedetti and R. V. Chiarenzelli, *Plating, Journal of the American Electroplaters' Society* **53,** No. 3, 305-308 (March, 1966).

This paper describes a technique using a gelled medium for porosity testing of gold electroplated on three common substrate materials. This method is a significant improvement over conventional electrographic porosity-testing techniques in both simplicity of use and ability to detect pores.

Precipitation Effects in Diffused Transistor Structures, J. M. Fairfield and G. H. Schwuttke, *Journal of Applied Physics* **37,** No. 3, 1536-1541 (March, 1966).

Transmission x-ray diffraction microscopy was used to detect precipitation effects in phosphorus-diffused silicon—especially after subsequent gold diffusion. The precipitate (after gold diffusion) appears to be a complex—formed by gold combining with excess phosphorus in the silicon lattice. This complex formation is responsible for the apparent high solubility of gold in phosphorus-diffused areas, and it has a potentially detrimental effect upon diode reverse characteristics. Further, this phenomenon provides a sink for gold atoms that would otherwise fill silicon lattice sites. This effect has important consequences on the fabrication of fast switching devices, since it tends to rob the crystal lattice of gold recombination centers.

The Preparation of Titanium Dichloride Dipropionate and Polypropylene With High Amorphous Content, J. Kumamoto, *The Journal of Polymer Science* **A3,** No. 9, 3355-3358 (September, 1965).

The synthesis of titanium dichloride dipropionate is described. High molecular weight, practically amorphous polypropylene has been prepared by the use of titanium dichloride dipropionate in combination with aluminum triisobutyl as a catalyst.

The Problem of Too Many Measurements in Pattern Recognition and Prediction, D. C. Allais, *IEEE International Convention Record,* Part 7, pp. 124-130 (March, 1966).

Investigators in the field of pattern recognition have shown that the performance of a recognition system sometimes deteriorates when additional measurements are included in the pattern analysis. This strange phenomenon is explained theoretically for the related problem of normal prediction, in which the parameters must be estimated.

A practical method is proposed for making the predictor more accurate by reducing the number of measurements. The effectiveness of this technique is shown by experiments with artificial data. The measurement selection procedure is then extended to the two-class pattern recognition problem, which is illustrated by experiments in weather forecasting and character recognition.

Properties of One-Dimensional Correlated Gaussian Wave Functions, T. R. Koehler, *Physical Review* **141,** No. 1, 281-286 (January, 1966).

The properties of a certain class of unsymmetrized one-dimensional correlated Gaussian wave functions—those which are ground-state eigenfunctions of some coupled harmonic-oscillator Hamiltonian—are investigated in detail. It is shown that a properly symmetrized wave function constructed from these may be used to calculate the expectation value E_0 of the Hamiltonian appropriate to a system of interacting one-dimensional atoms and that this energy is, to a high degree of accuracy, equal to the value obtained when the unsymmetrized wave function is used. A method is given by which correction terms to E_0 may be obtained. In addition, it is found that even though the number of particles be very large, the necessary multi-variable integrals may be performed quite simply.

Recognition of Printed Chinese Characters, R. Casey and G. Nagy, *IEEE Transactions on Electronic Computers* **EC-15,** No. 1, 91-101 (February, 1966).

The problem of recognizing a large alphabet (1,000 different characters) is approached using a two-stage process. In the first stage of design, the data is partitioned into groups of similar characters by means of heuristic and iterative algorithms. In the second stage, peephole templates are generated for each character in such a way as to guarantee discrimination against other characters in the same similarity class. Recognition is preceded by establishing an order of search through the groups with a relatively small number of "group masks." The character is then identified by means of the "individual masks" through a threshold criterion. The effects on the error and reject rates of varying the several parameters in the design and test procedures are described on the basis of computer simulation experiments on a 20,000 character data set. An error rate of 1%, with 7% rejects, is obtained on new data.

The Role of Water in Deoxygenated Hemoglobin Solutions, T. L. Fabry and H. A. Reich, *Biochemical and Biophysical Research Communications* **22,** No. 6, 700-703 (1966).

The proton relaxation rate of water containing hemoglobin was measured as a function of various chemical states of the solute. No difference in rates was found between oxy-, deoxy-, and carbonmonoxy-hemoglobin, indicating that the binding site of oxygen is inaccessible to the water protons.

Second-Order Magnetoelastic Properties of Yttrium Iron Garnet, D. E. Eastman,* *Journal of Applied Physics* **37,** No. 3, 996-997 (March, 1966).

Second-order (in strain) magnetoelastic properties of yttrium iron garnet (YIG) have been studied using an ultrasonic technique. The group velocity of selected small-amplitude magnetoelastic (dominantly elastic) modes in single-crystal specimens has been measured at a frequency of 30 Mc/sec as a function of magnetic field strength and magnetization orientation. In this manner, first-order and second-order magnetoelastic constants and second-order "morphic" constants have been completely determined for YIG. All results have been interpreted using finite deformation magnetoelastic theory.

* Based on a thesis submitted to Department of Electrical Engineering, MIT, in partial fulfillment of the requirements for the Doctor of Philosophy degree (August, 1965).

The Separation of Diazonium Salts by Thin-Layer Chromatography, R. J. Gritter, *Journal of Chromatography* **20,** No. 2, 416-417 (November, 1965).

A solvent system for the thin layer chromatographic separation of the relatively unstable ionic species, fluoborate and chlorozincate salts of diazonium ions, has been worked out. The solvent components are a 25:1:5:20 mixture of dimethylsulfoxide: formic acid: chloroform: dioxane. Since the stabilizing salts have an Rf of 1.0, the polar solvent components used or the calcium sulfate in the silica gel G stabilize the diazonium cation during the separation. The Rf values for a number of diazonium compounds, which have also been isolated from the chromatoplates, have been measured.

Spectrochemical Analysis of Abrasive Materials, T. S. Long, *Applied Spectroscopy* **20,** No. 2, 114-116 (March-April, 1966).

Analysis of abrasive feed rolls used in IBM computers by a power d-c arc technique is described. The feed rolls require special analysis because of the large amounts of aluminum, silicon, iron, and titanium oxides (2%-100%). In this method, the sample is ground to a powder form and mixed with graphite and metallic germanium. The addition of graphite and germanium as buffers produced a very stable arc in which a homogeneous mixture was attained early in the excitation, resulting in uniform and reproducible spectral lines. Germanium also serves as the internal standard. The sample is placed in a graphite cup carbon and excited in a 10 ampere d-c arc. The National Bureau of Standards series 76 through 78 were successfully used in place of synthetic standards. Analytical lines, apparatus, and excitation parameters are described in detail. Typical concentration curves are shown and the precision, in which the average coefficient of variation for all elements is less than 12.0, is also given.

Structure and Reactivity of Methoxy-Substituted Benzenediazonium Cations, R. J. Cox and J. Kumamoto, *Journal of Organic Chemistry* **30,** No. 12, 4254-4257 (December, 1965).

A systematic relationship between the molecular structure of methoxy-substituted benzenediazonium salts and the *N-N* stretching frequency has been observed. This is useful in the identification and classification of these molecules. Resultant substituent constants, σ^+, for multiple substituted derivatives were assigned on the basis of their observed *N-N* frequencies and a Hammett ρ-σ correlation of the rate constants for the coupling reaction with 6-naphthol-2-sulfonate produced a ρ of 3.05.

A Supported Catalyst for the Polymerization of Propylene and Other α-Olefins, W. A. Hewett, *Polymer Letters* **3,** No. 10, 855-857 (October, 1965).

A new heterogeneous catalyst system for the polymerization of propylene and other α-olefins is described. This system is composed of aluminum alkyls and minute amounts of titanium or vanadium halides supported on a carrier halide from the $CdCl_2$ and CdI_2 groups of bivalent halides (e.g. 0.015 millimoles $TiCl_4$/3g $CoCl_2$).

Surface State and Surface Recombination Velocity Characteristics of Si-SiO_2 Interfaces, L. L. Rosier, *IEEE Transactions on Electron Devices* **ED-13,** No. 2, 260-268 (February, 1966).

A new device used to study the surface recombination velocity and surface state characteristics of Si-SiO_2 interfaces consists of an epitaxially formed junction diode. When the junction is forward-biased, minority carriers are injected from the heavily doped substrate into the lightly doped epitaxial region. The thickness of the epitaxial region is much less than the diffusion length for minority carriers. Thus, the diode current for a given junction forward bias is directly proportional to surface recombination velocity at the Si-SiO_2 interface. A gate electrode over the SiO_2 has been included to vary surface potential. Thus, this new device permits one simultaneously to study MOS capacitance-voltage characteristics and surface recombination velocity. The capacitance-voltage characteristics indicate that the surface states exhibit a quasi-continuous energy distribution. The *n*-type surfaces exhibited donor levels in the range of $\sim$0.15 to $\sim$0.45 eV above the valence band; their density was found to vary from $\sim 5 \times 10^{12}$ to 5×10^{13} states/cm^2/eV. In contrast, *p*-type surfaces exhibited acceptor levels lying in the range of $\sim$0.15 to $\sim$0.45 eV below the conduction band; their density was comparable to those observed on *n*-type surfaces. The maximum value of surface recombination velocity was found to vary from 3×10^3 to $> 10^4$ cm/s. Surface recombination velocity was found to correlate directly with surface state density.

Talking with Computers, E. Paris, *Science Journal* **2,** No. 3, 68-73 (March, 1966).

This paper summarizes some recent work in voice communication with computers.

Two-Configuration, Self-Consistent Field Theory, A. Veillard,* *Theoretica Chimica Acta* **4,** No. 1, 22-29 (1966).

The Hartree-Fock pseudoeigenvalue equations have been derived for configuration interaction in the case of two atomic configurations ns^2np^N and np^{N+2}. A special case of investigation is the interaction between the nearly degenerate configurations $1s^22s^22^N$ and $1s^22p^{N+2}$. The LCAO form of the equations has also been established.

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Valence Excited States of N_2, CO, and BF, R. K. Nesbet, *Journal of Chemical Physics* **43,** No. 12, 4403-4409 (December, 1965).

Excitation energies and other spectroscopic constants (r_e, ω_e, $\omega_e x_e$, B_e) are computed for excited electronic valence states of N_2, CO, and BF and their singly positive ions. The states considered are the lowest states of symmetry $^1\Sigma^-$, $^1\Delta$, $^1\Pi$, $^3\Pi$, $^3\Sigma^+$, $^3\Delta$, $^3\Sigma^-$ for the molecules and $^2\Sigma^+$, $^2\Pi$ for the irons. Approximate ground-state Hartree-Fock molecular orbitals and the first unoccupied π orbital obtained by diagonalizing the ground-state one-electron Hamiltonian in a limited orbital basis set are used to construct electronic wavefunctions of the correct symmetry for each excited state. Electric dipole moments and dipole-moment derivatives are computed. The computed Σ and Δ states of BF lie above the first ionization limit and are not expected to represent observable physical states. Computed spectroscopic constants for the other states considered are compared with observed data.

Letters

Application of Adsorption Electroanalysis to the Trace Determination of Tetrabutylammonium Ion, S. L. Phillips, *Journal of Analytical Chemistry* **38,** No. 2, 343-344 (February, 1966).

Discussion of "On the Almost Sure Stability of Linear Dynamic Systems with Stochastic Coefficients," C. B. Mehr,* and P. K. C. Wang,** *ASME Transactions, Journal of Applied Mechanics* **33,** No. 1, 234-236 (March, 1966).

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Phase Diagram for the Pseudobinary System InSb-InSe, D. F. O'Kane and N. R. Stemple, *Journal of the Electrochemical Society* **113,** No. 3, 289-290 (March, 1966).

Phase Diagram for the Pseudobinary System of Sb-SnTe and Some Electrical Properties of the Ternary Alloys, D. F. O'Kane and N. R. Stemple, *Journal of the Electrochemical Society* **113,** No. 3, 290-292 (March, 1966).

Vaporization of PbO-PbF_2 Melt During Solution Growth of YIG Crystals, E. A. Giess, *Journal of The American Ceramic Society* **49,** No. 2, 104-105 (February, 1966).